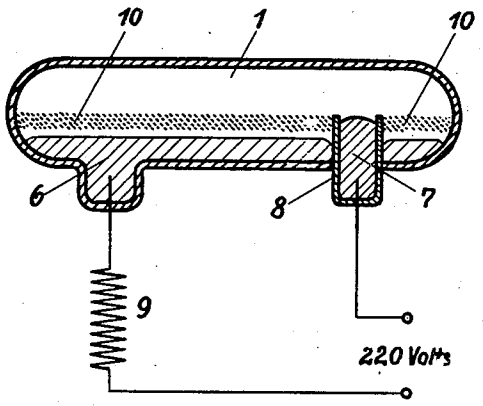
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METHOD OF AND DEVICE FOR PRODUCING SANITARY, HYGIENIC, AND CHEMICAL EFFECTS

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## METHOD OF AND DEVICE FOR PRODUCING SANITARY, HYGIENIC, AND CHEMICAL EFFECTS

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Our invention relates to a method of and devices for producing sanitary, hygienic, and chemical effects, by using rays of short wave length and it has particular relation to a device for producing small quantities of such rays.

The sanitary and hygienic effects produced by rays of short wave length are well known. Such rays are mainly used to cure diseases, to generate ozone, to decompose chemical combinations, to destroy bacteria, etc. In practice, these rays are produced by employing a carbon-arc, or, most frequently a quartz mercury arc lamp. However, the current consumption of these lamps is in many cases too large, or the effect produced by them is too intense. It is our invention to use a glow-discharge for generating rays in such cases where the production of small quantities of rays is desired in an inexpensive manner, instead of utilizing a luminous arc as a generator of rays. This discharge is produced in a vessel, made for example of quartz, which these rays can permeate. To this effect, the vessel is filled with rarified gases and is preferably also equipped with a bottom-body consisting of a material, for example mercury the vapors of which emit rays of short wave lengths. In the latter case the vessel is filled with an amount of vapors of this material, the expansion of which is determined by the temperature of the vessel.

Our invention will be more fully understood and appreciated by reference to the following description of an embodiment of our invention.

In connection with this description, we have shown diagrammatically in the accompanying single sheet of drawing, by way of example, a ray producer adapted to be operated from a commercial current source.

The device comprises an envelope consisting of a material, such as quartz, for example, which is permeable by rays of very short wave length; in other words, a material which is permeable to hyper-ultra-violet rays. This envelope is designated in the drawing by numeral 1. The cathode of the device is represented by a mercury mirror 6 which covers the bottom of the vessel 1 totally or partially, and which is connected to the negative pole of a source of current by way of the resistance 9. A quartz member 8 is introduced into the vessel 1, containing the mercury body 7 which is the anode of the device, separated from the mercury mirror 6 by the quartz wall of the member 8, and which is connected to the positive pole of a source of current.

The vessel 1 may be filled with a rarefied gas, and we have found that it is most suitable to fill the vessel with noble gas, which is particularly serviceable because the tension required for operation may be relatively low, and because the vessel 1 is quickly heated and therefore evaporates a larger amount of the mercury, thereby increasing the intensity of the rays of short wave length. We found it suitable to provide for such pressure of the rarefied gas as to produce a definitely manifest and sharply defined glowing film, or glow discharge, the pressure being, for helium about 8–15 mm. Hg, and for argon about 2–3 mm. Hg. Argon has proved to be the best medium, being a poor heat conductor and having at the same time the property of intensively emitting rays of short wave length.

Mercury has been found particularly suitable as a medium which, when vaporized during the discharge of the device, emits rays of very short wave length. It may be mentioned, however, that other materials, e. g., potassium, and lithium, etc., may be employed in place of mercury.

When the device is connected to a source of current, as shown in the drawing, over a circuit including the resistance 9 in series with the cathode 6, a glow discharge will be produced between the electrodes 6 and 7 which is sharply defined by a glowing film of gases and vapors above the surface of the cathode 6, and which serves as a medium for the emission of hyper-ultra-violet rays. This defined glowing film is indicated in the drawing by the dotted lines 10.

It will be seen from the foregoing that the device represents a novel combination of individually known phenomena and elements, and that a novel and highly useful product has resulted from combining these elements in the manner explained above. To be more specific it has been known that ultra-violet rays may be produced by a glow discharge (as distinguished from an arc discharge); that a glow discharge can be maintained with a commercial current source (220 volts and less) if produced in noble gas and by properly spacing the electrodes; and lastly, it has been known that pure quartz is permeable to rays of very short wave length. The novel result consists in the device explained, which is a fool proof apparatus operable by any person, and which may be used for producing ozone or for permanently radiating rooms by ultra-violet rays. The device is simple in manufacture and operation, and permits the beneficial application of ultra-violet rays without expert assistance and without considerable expenditure and trouble.

Apart from the obvious advantages enumerated above, the device has a number of favorable features, and the most conspicuous shall now be briefly mentioned. One of the most annoying features of the usual luminous discharge lamps equipped with electrodes having extended surfaces of sheet iron or the like, resides in the blackening of the translucent envelope due to disintegration and decomposition of the electrodes during discharge. The electrodes are, generally stated, electrically reduced to dust, and this dust is deposited on the inner walls of the translucent envelope. This disadvantage is avoided in the present case due to a mercury mirror totally covering the electrodes. Only mercury is vaporized, therefore, and deposits on the walls resulting from the vaporizing of mercury, are easily washed off by simply shaking the device.

Though we have described and illustrated only one embodiment of the invention, it will be understood that we do not desire to be limited in its application to the precise structure shown, but only to the limitations defined in the following claims.

What we claim as new and desire to secure by Letters Patent is:

1. A glow discharge lamp for producing and for radiating ultra violet rays of a dosage below the point causing erythema when used for therapeutic purposes in continuous irradiation, comprising a horizontally disposed quartz vessel filled with a noble gas, a mercury cathode disposed at the bottom of said vessel, a substantially cup shaped quartz member projecting through said cathode into the interior of said vessel, an anode disposed within said member, a resistance element connected exteriorly of said vessel in series with said cathode for insuring a definite glow discharge within said vessel and thereby producing said rays when said lamp is connected to a current source, a terminal connected to said resistance, and a terminal connected exteriorly to said member holding said anode, said terminals, said resistance, and said vessel containing said cathode and said anode forming a self contained operating unit.

2. A glow discharge lamp for producing and for radiating ultra violet rays of non-erythematic order and dosage and adapted to be used for continuous irradiation for therapeutic and for hygienic purposes, comprising a horizontally disposed quartz vessel filled with a noble gas, an electrode of volatile substance disposed in said vessel, a second vessel projecting into said principal vessel, an electrode disposed within said second vessel, a resistance element connected exteriorly of said principal vessel in series with said first electrode for insuring a definite glow discharge within said principal vessel and thereby producing said rays when said lamp is connected to a source of current, a terminal connected to said resistance, and a terminal connected to the electrode contained within said second vessel, said terminals, said resistance, and said vessels forming a self contained operating unit.

3. A glow discharge lamp comprising a horizontally disposed vessel of material transparent to ultra-violet rays filled with a noble gas; a mercury cathode electrode disposed at the bottom of said vessel; a substantially cup-shaped member projecting through said cathode into the interior of said vessel; an anode electrode disposed within said member; a resistance element connected outside of said vessel in series with one of said electrodes for insuring a definite glow discharge within said vessel and thereby producing ultra-violet rays when said lamp is connected to a current source; a terminal connected to the free end of said resistance; a further terminal connected outside of said member for holding said anode; said terminals, said resistance, and said vessel containing said cathode and said anode forming a self-contained operating unit.

4. The combination of a glow discharge device comprising an envelope permeable to ultra-violet rays, a mixture of a noble gas and an actinic vapor therein, a cathode and anode, said cathode having an emitting surface substantially larger than the surface of said anode, means including a resistance element connected outside of said envelope in series with one of said electrodes for preventing an arc discharge between said electrodes and insuring the maintenance of a definite glow discharge within said envelope and thereby producing ultra-violet rays of short wave length below the point of causing erythema when said device is connected to a current source.

5. The combination of a glow discharge device comprising an envelope permeable to ultra-violet rays, a mixture of a noble gas and mercury vapor therein, a mercury cathode and anode therein, said cathode having a substantially larger emitting surface than the surface of said anode, means including a resistance element connected outside of said envelope in series with one of said electrodes for preventing an arc discharge between said electrodes and insuring the maintenance of a definite glow discharge through said noble gas and thereby activating the mercury vapor to produce ultra-violet rays of short wave length below the point of causing erythema when said device is connected to a current source.

6. The combination of a glow discharge lamp comprising a vessel permeable to ultra-violet rays, an inert gaseous atmosphere therein, a mercury cathode at the bottom of said vessel, a mercury anode in said vessel, a separating wall between said cathode and said anode, outside connecting leads from said cathode and anode, a resistance element connected outside of said vessel to one of said leads for insuring the maintenance of a definite glow discharge within said vessel and thereby producing ultra-violet rays below the point of causing erythema when said lamp is connected to a current source, said resistance, said leads and said vessel containing said cathode and said anode forming a self-contained operating unit.

7. A glow discharge lamp comprising a vessel of material permeable to ultra-violet rays filled with a noble gas, a mercury cathode disposed therein, a mercury anode, a separating wall between said cathode and said anode, a resistance element connected outside of said vessel in series with one of said electrodes for insuring the maintenance of a definite glow discharge within said vessel, and thereby producing ultra-violet rays below the point of causing erythema when said vessel is connected to a current source, a terminal connected to the free end of said resistance, a further terminal outside of said vessel connected to said anode, said terminals, said resistance and said vessel containing said cathode and said anode forming a self-contained operating unit.

8. The combination with a glow discharge lamp comprising a vessel permeable to ultra-violet rays, an inert gaseous atmosphere therein, a mercury cathode and anode therein, said cathode having a substantially larger emitting surface than the surface of said anode, a separating

wall between said electrodes, outside connecting leads to said electrodes, and means including a series resistance connected to one of said leads for insuring the maintenance of a definite negative glow discharge producing a negative glowing layer covering one of said electrodes when said lamp is connected to a current source, said resistance, said leads and said vessel containing said electrodes forming a self-contained operating unit.

9. The combination with a glow discharge device comprising a vessel permeable to ultra-violet rays, an inert gaseous atmosphere therein, a positive electrode therein, a negative electrode of relatively large surface compared with said positive electrode, outside leads to said electrodes, and means including a series resistance connected to one of said leads for insuring a definite glow discharge to produce a negative glowing layer covering said cathode when said device is connected to a current source, said resistance, said leads and said vessel containing said cathode and said anode forming a self-contained operating unit.

10. The combination with a glow discharge device comprising a vessel permeable to ultra-violet rays, a noble gas atmosphere therein, a mercury anode therein, a mercury cathode of relatively large surface compared to said anode, outside connecting leads to said cathode and said anode, and means including a resistance element connected to one of said leads for insuring a definite glow discharge through said device to produce a negative glowing layer covering said cathode when said device is connected to a current source, said resistance, said leads and said vessel containing said cathode and said anode forming a self-contained operating unit.

11. The combination with a glow discharge device comprising an envelope permeable to ultra-violet rays, a mixture of a noble gas and an actinic vapor therein, a cathode and anode therein, said cathode having a substantially larger emitting surface than the surface of said anode, and means for insuring the maintenance of a definite electric glow discharge between said electrodes and thereby producing ultra-violet rays below the point of causing erythema when said device is connected to a current source.

12. The combination with a glow discharge device comprising a vessel permeable to ultra-violet rays, a noble gas atmosphere therein, said cathode having a substantially larger emitting surface than the surface of said anode, a mercury cathode and a mercury anode therein, a separating wall between said cathode and anode, and means for producing and insuring the maintenance of a definite electric glow discharge between said cathode and said anode thereby producing mercury vapor within said vessel activated by the glow discharge for radiating ultra-violet rays below the point of causing erythema.

13. The combination of a glow discharge device comprising an envelope permeable to ultra-violet rays, a mixture of a noble gas and an actinic vapor therein, a cathode and anode therein, said cathode having a substantially larger emitting surface than the surface of said anode, and means for limiting the current to produce and maintain an electric glow discharge between the electrodes to produce ultra-violet rays of wave lengths below the point of causing erythema.

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